
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2009/2010

April/May 2010

IBG 102 – Biology for Technologists
[Biologi Untuk Ahli Teknologi]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of ELEVEN pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEBELAS muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **FIVE (5)** out of six questions. Answer **FOUR** questions from SECTION A and **ONE** question from SECTION B. You may answer the questions either in Bahasa Malaysia or in English.

Arahan: Jawab **LIMA (5)** daripada enam soalan. Jawab **EMPAT** soalan daripada BAHAGIAN A dan **SATU** soalan daripada BAHAGIAN B. Anda dibenarkan menjawab soalan sama ada [untuk KBI] dalam Bahasa Malaysia atau Bahasa Inggeris.]

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

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SECTION A. Answer ALL questions.

1. Answer all parts of this question.
 - (a) Discuss the advantages and disadvantages of dark-field microscopy compared to that of bright-field microscopy.
(7 marks)
 - (b) Explain the need of immersion oil in bright field microscopy.
(3 marks)
 - (c) Explain the concept of scanning electron microscopy.
(10 marks)
2. Answer all parts of this question.
 - (a) Antibiotics are generally secondary metabolites. Define secondary metabolism.
(2 marks)
 - (b) Describe the fermentation of penicillin production by *Penicillium chrysogenum* and the factors that affect the fermentation process.
(18 marks)
3. Answer all parts of this question.
 - (a) Briefly describe the following vaccines:
 - (i) Inactivated vaccines.
(2 marks)
 - (ii) Live attenuate vaccines.
(2 marks)
 - (iii) Subunits vaccines.
(2 marks)
 - (iv) Toxoids vaccines.
(2 marks)
 - (b) Briefly explain the advantages of using mammalian cell lines for the production of vaccines.
(4 marks)
 - (c) Describe the process of vaccine production by using mammalian Vero cell lines.
(8 marks)

4. Answer all parts of this question.

- (a) Describe bioaugmentation and biostimulation, and discuss the differences between these two processes.

(10 marks)

- (b) Describe the advantages of plant tissue culture in phytoremediation.

(10 marks)

SECTION B. Answer ONE question.

5. Answer all parts of this question.

- (a) Determine the length and width of the microorganism as observed in Figure 1.
(10 marks)

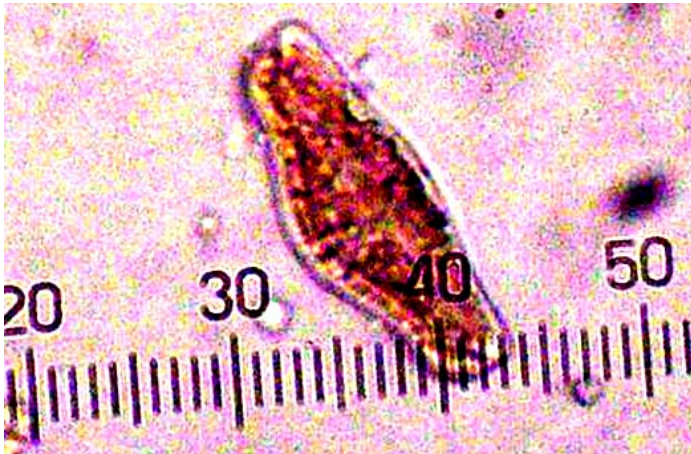
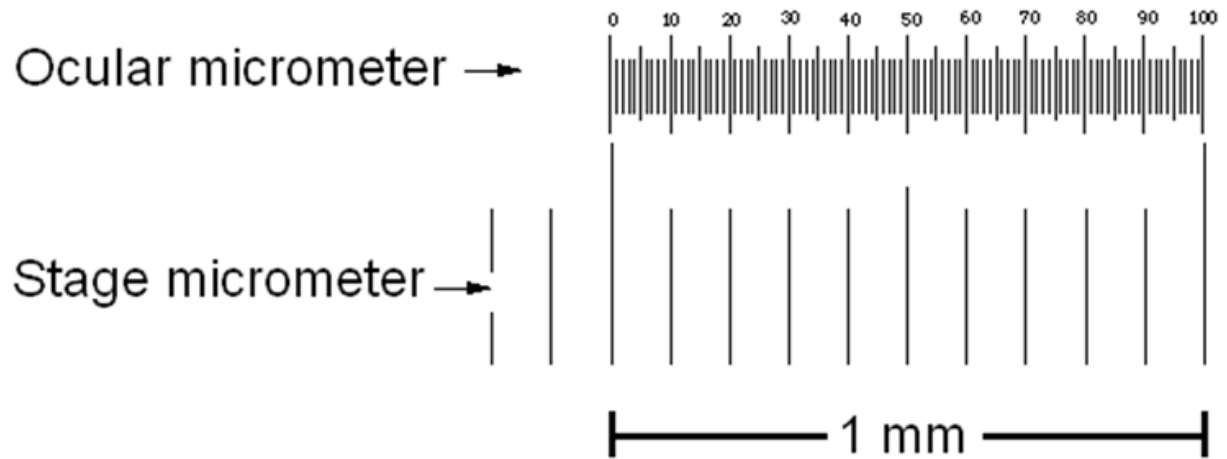


Figure 1: A single cell as observed under the microscope

- (b) An aliquot of sample from a microbial solution was placed on a Neubaur chamber with a depth of 0.1 mm (Figure 2).

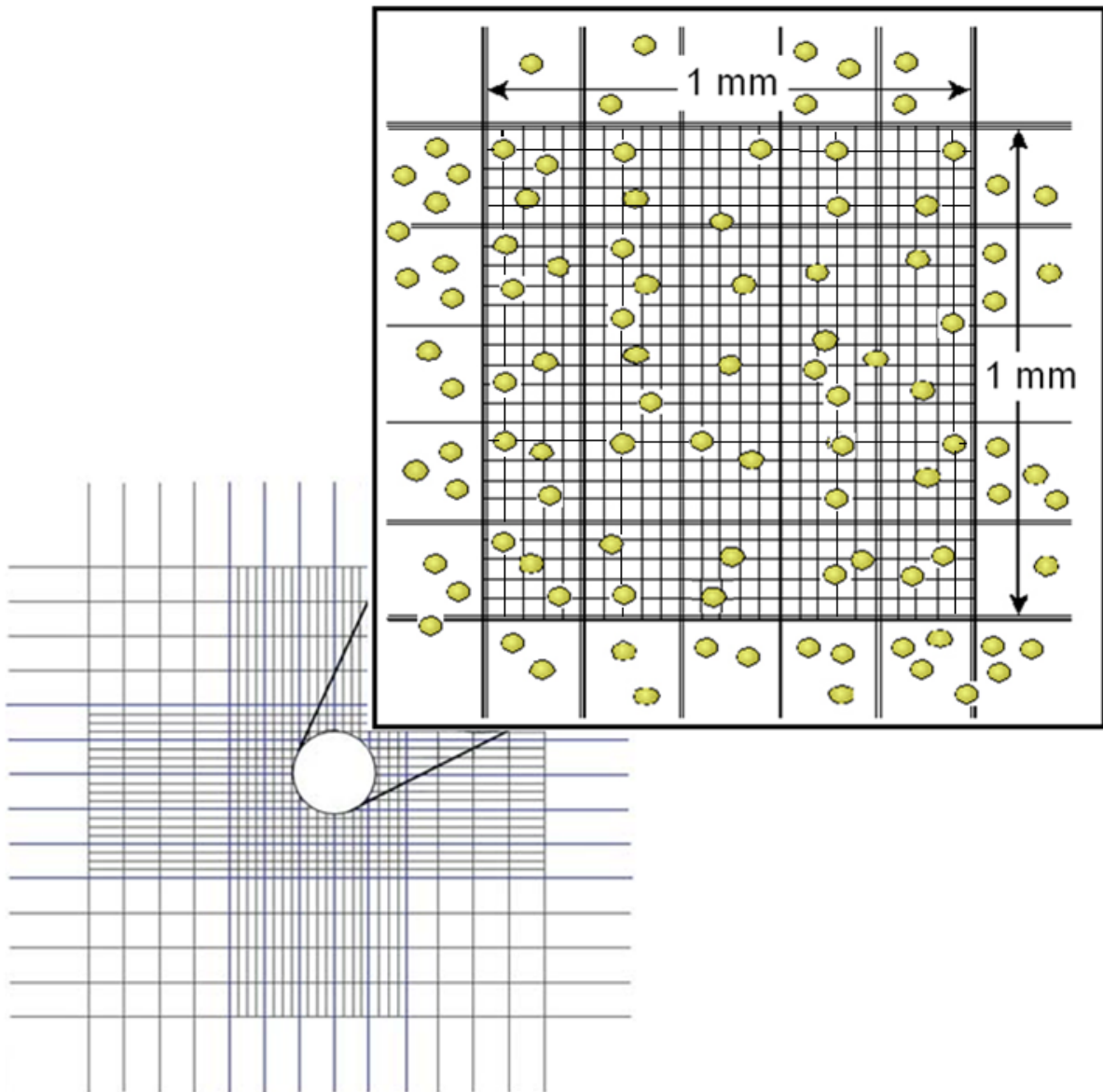


Figure 2: Cells as observed on a Neubaur chamber

Assuming without dilutions, calculate the number of bacterial cells per mL of the sample.
(10 marks)

6. Answer all parts of this question.

- (a) Discuss the importance of aseptic techniques in bioprocess laboratory practice.
(3 marks)
- (b) Describe the principles of an autoclave.
(7 marks)
- (c) Beginning with the aseptic transfer of microorganisms from a universal bottle using a micropipette, detail the steps involved in pour plating.
(10 marks)

BAHAGIAN A. *Jawab SEMUA soalan.*

1. *Jawab semua bahagian dalam soalan ini.*

(a) *Bincangkan kebaikan dan keburukan mikroskopi medan-gelap berbanding dengan medan-cerah.*
(7 markah)

(b) *Jelaskan keperluan minyak pencelup dalam mikroskopi medan-cerah.*
(3 markah)

(c) *Jelaskan konsep mikroskopi pensakanan elektron.*
(10 markah)

2. *Jawab semua bahagian dalam soalan ini.*

(a) *Antibiotik secara umumnya adalah metabolit sekunder. Taksirkan metabolisme sekunder.*
(2 markah)

(b) *Jelaskan fermentasi penghasilan penisilin oleh *Penicillium chrysogenum* dan factor-faktor yang mempengaruhi proses fermentasi tersebut.*
(18 markah)

3. *Jawab semua bahagian dalam soalan ini.*

(a) *Jelaskan secara ringkas vaksin yang berikut:*

(i) *Vaksin teraktif.*
(2 markah)

(ii) *Vaksin hidup ternyahaktif.*
(2 markah)

(iii) *Vaksin subunit.*
(2 markah)

(iv) *Vaksin toksoid.*
(2 markah)

(b) *Jelaskan secara ringkas kebaikan sel mamalia untuk penghasilan vaksin.*
(4 markah)

(c) *Jelaskan proses penghasilan vaksin melalui sel mamalia Vero.*
(8 markah)

4. *Jawab semua bahagian dalam soalan ini.*

(a) *Jelaskan bioaugmentasi dan biostimulasi, dan bincangkan perbezaan di antara kedua-dua proses ini.*

(10 markah)

(b) *Jelaskan kebaikan tisu kultur tumbuhan dalam phytoremediasi.*

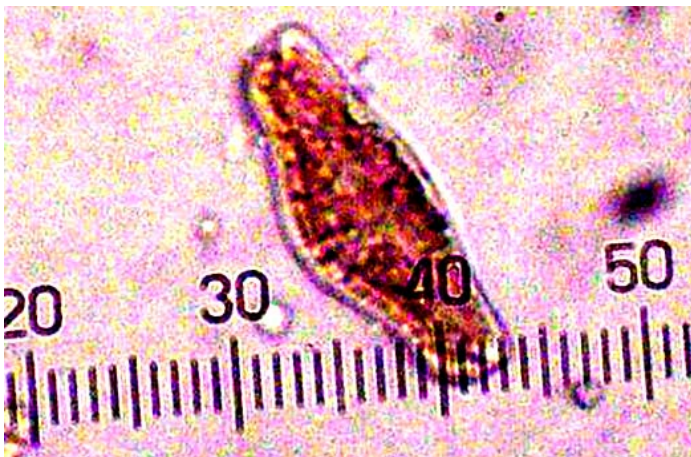
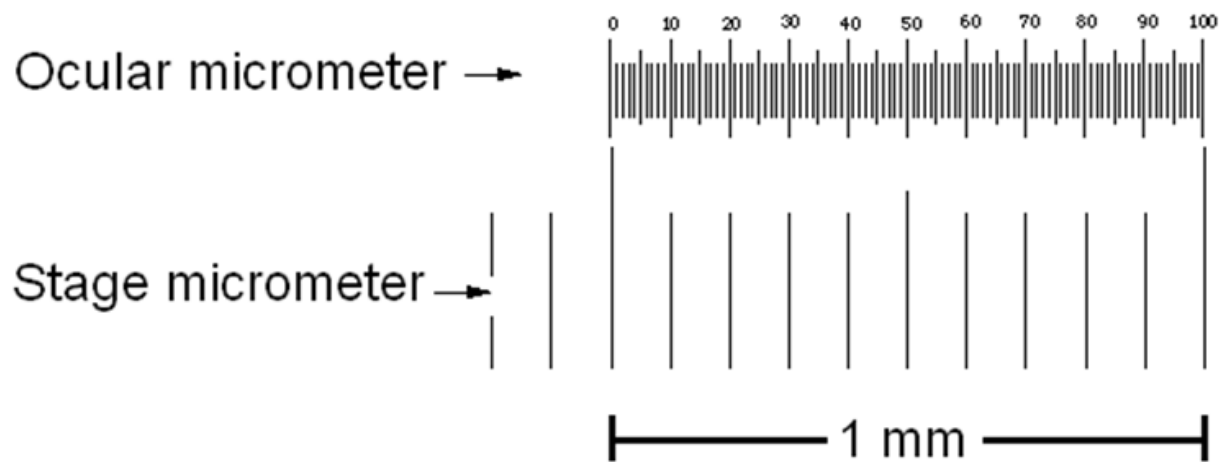
(10 markah)

BAHAGIAN B. Jawab SATU soalan sahaja.

5. Jawab semua bahagian dalam soalan ini.

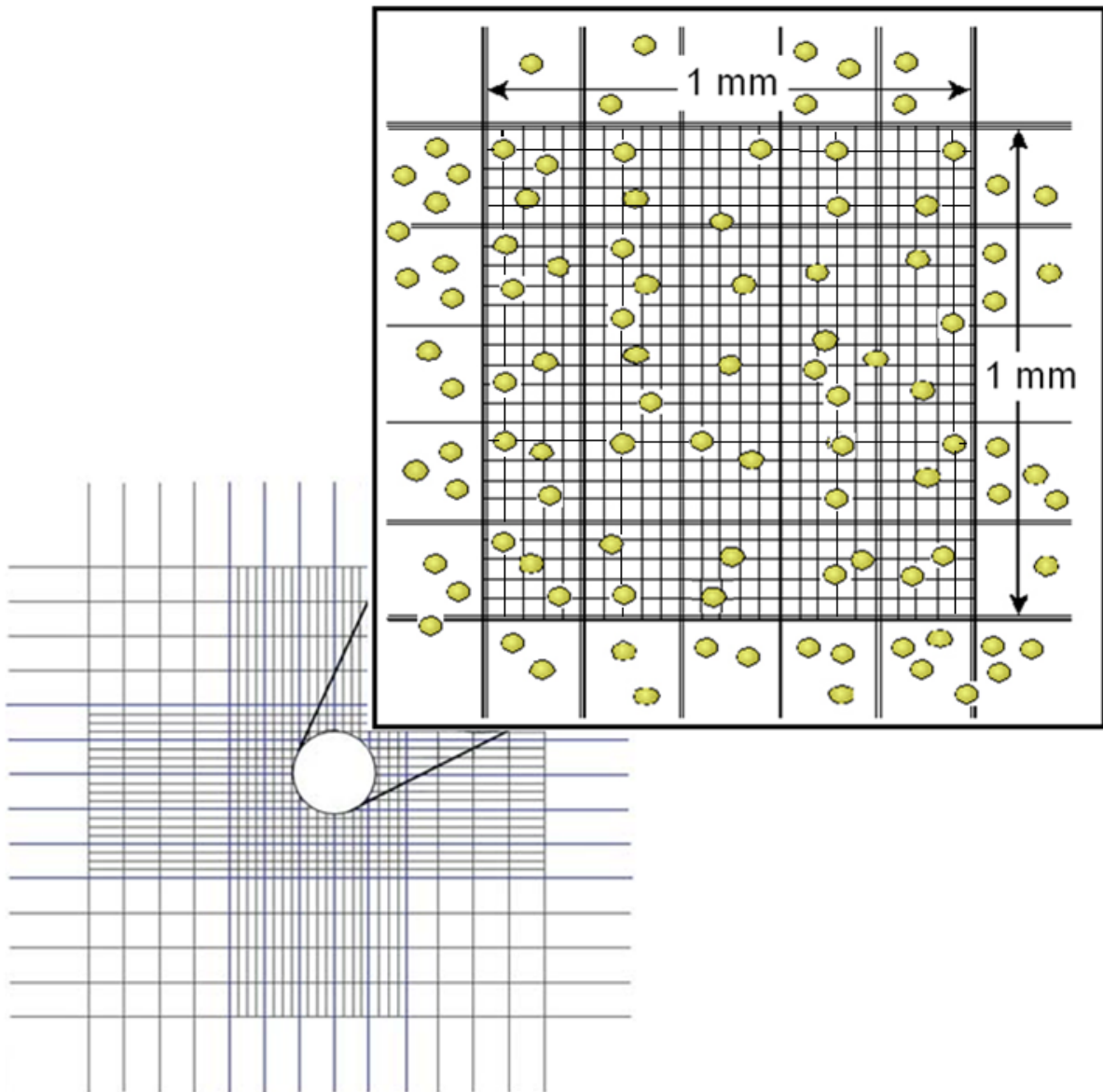
(a) Tentukan panjang dan lebar mikroorganisma seperti yang diperhatikan dalam Rajah 1.

(10 markah)



Rajah 1: Sel tunggal yang diperhatikan di bawah mikroskop

- (b) *Aliquot satu sampel daripada larutan microbial diletakkan pada kebuk Neubaur dengan kedalaman 0.1 mm (Rajah 2).*



Rajah 2: Sel-sel yang diperhatikan pada kebuk Neubaur

Andaikan tiada pencairan, kirakan bilangan sel bacteria dalam satu mL sampel.

(10 markah)

6. *Jawab semua bahagian dalam soalan ini.*

(a) *Bincangkan kepentingan teknik aseptik dalam amalan makmal bioproses.*
(3 markah)

(b) *Jelaskan prinsipal autoklaf.*
(7 markah)

(c) *Bermula dari pemindahan aseptik mikroorganisma daripada botol universal dengan menggunakan pipet mikro, perincikan langkah-langkah yang terlibat dalam curahan plat.*
(10 markah)